

## **REMARKS**

### **Claim Status**

Claims 1-4, 6-14 are currently pending, with claim 1 being the sole independent claim. Claim 3 has been canceled. Claim 1 has been amended to incorporate the subject matter of canceled claim 3. The amendments to claims 2, 4, 6, 7, 9 and 10 are to correct minor claim wording, and are cosmetic in nature. No new matter has been added by way of this amendment. Reconsideration of the application, as amended, is respectfully requested.

### **Overview of the Office Action**

Claims 1-4, 6, 9 and 10 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 6,005,717 ("*Neuberger*"), while claims 7, 8, 11 and 14 stand rejected under 35 U.S.C. §103(a) as unpatentable over *Neuberger* in view of U.S. Patent No. 6,771,686 ("*Ullman*"). Claims 12 and 13 stand rejected under 35 U.S.C. §103(a) as unpatentable over *Neuberger* in view of U.S. Patent No. 5,386,431 ("*Tulip*"). Applicants have carefully considered the Examiner's rejections, and the comments provided in support thereof, and respectfully disagree with the Examiner's analysis. For the following reasons, Applicants respectfully assert that all claims of the present application are patentable over the cited references.

### **Summary of the Subject Matter Disclosed in the Specification**

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

The invention is directed to a coupling-in device for light from a plurality of light sources into an optical waveguide, wherein the coupling-in device has a plurality of focusing optics for

the light from the various light sources (see pg. 2, paragraph [0001] of the originally filed specification)).

In accordance with the invention, the light from the various light sources is concentrated by virtue of a plurality of focusing optics 5 that are integrated into the coupling-in device, so that significantly less area is required per light beam coupled into the optical waveguide. As a result, it becomes possible to couple, into the optical waveguide via the coupling-in device, light from significantly more light sources than previously possible through a direct arrangement of the light sources upstream of the end of the optical waveguide (see pg. 2, paragraph [0007] to [0008] of the originally filed specification).

A further enhancement of the claimed coupling-in device is achieved by virtue of the optical waveguide having a coupling-in area 3, which is likewise formed in a focusing fashion. As a result, the formed focusing coupling-in area causes a further concentration of the light beams such that light from even more different light sources can be coupled into the optical waveguide (see pg. 2 to pg. 3, paragraph [0011] of the originally filed specification).

### **Descriptive Summary of the Prior Art**

*Neuberger* discloses “a small, scalable, and inexpensive semiconductor diode laser system that includes a diode laser beam combiner comprising a cylindrical microlens, a lens array, and a fan window that optically combines energy outputs of at least two diode laser emitters or emitter groups” (see col. 4, lines 4-9).

*Ullman* discloses “a laser diode arrangement with at least one row of emitter elements which emit laser light and which are arranged in the row with their active layer in a common plane and perpendicular to their first axis” (see col. 1, lines 11-14).

*Tulip* discloses “a slab laser amplifier array that includes a plurality of parallel, stacked, laser resonators, wherein each resonator has a walk-off mode of propagation of laser light from an input side of the resonator to an output side of the resonator, where the exiting light diffracts around the resonator mirror” (see *Abstract*).

**Patentability of the Claims Under 35 U.S.C. §102(b)**

Independent claim 1 has been amended to include the features of canceled claim 3, wherein the feature of “formed in focusing fashion” has been replaced by “curved in a focusing fashion”. Support for the feature of a coupling-in area being curved in a focusing fashion is illustrated, for example, in Figure 1, with various curvatures being described in paragraph [0025]. No new matter has been added.

The Examiner (pg. 4 of the Office Action) contends that *Neuberger* discloses a coupling-in device with all the features of the claimed invention, wherein a coupling-in area of an optical waveguide is likewise formed in a focusing fashion. However, Applicant’s amended claim 1 is directed to a coupling-in device for light from a plurality of light sources into an optical waveguide, having a plurality of focusing optics for the light from the various light sources, wherein the optical waveguide has a coupling-in area, which is likewise curved in a focusing fashion. *Neuberger* (col. 7, lines 12-14) only teaches that the energy combined by the disclosed optics of a laser system can be coupled into a standard optical fiber, wherein the standard optical fiber is round.

*Neuberger* fails to teach or suggest in any portion of the disclosed text or figures that the optical fiber has a coupling-in area that is curved in a focusing fashion, as recited in amended independent claim 1. In view of the foregoing, Applicants respectfully assert that amended

independent claim 1 is not anticipated by *Neuberger*. Therefore, reconsideration and withdrawal of the rejection under 35 U.S.C. §102 is in order, and a notice to that effect is earnestly solicited.

Moreover, due to the fundamental above-discussed difference between the present claimed invention and *Neuberger*, it is clear that the present invention is patentable over this reference under 35 U.S.C. §103.

#### **Patentability of the Claims Under 35 U.S.C. §103(a)**

The Examiner cites *Ullman* in an attempt to cure the shortcomings of *Neuberger*, i.e., the failure to teach “ a device wherein the focussing optics (5) and the coupling area (3) are produced in one piece”. The Examiner also cites *Tulip* based on the failure of *Neuberger* to teach “a device wherein the coupling-in area and/or focusing optics are arranged in a circle-like fashion and wherein the coupling-in area and/or focusing optics are arranged around the end of the stem”. However, the combination of *Neuberger*, *Ullman* and/or *Tulip* fails to achieve the invention recited in amended independent claim 1, since neither *Ullman* nor *Tulip* teach or suggest an optical waveguide with a coupling-in area, which is curved in a focusing fashion, as recited in amended independent claim 1.

It is an object of the present invention to provide a coupling-in device for light from a plurality of light sources into an optical waveguide which largely avoids losses. This object is attained by a plurality of focusing optics combined with an optical waveguide having a coupling-in area that is curved in a focusing fashion. The divergence of the radiation emanating from the plurality of light sources can be reduced, firstly, by the plurality of focusing optics and, secondly, by the coupling-in area that is curved in a focusing fashion similarly to the focusing optics.

In contrast, *Neuberger* discloses a diode laser array system that is capable of combining laser outputs from at least two diode laser emitters. The system disclosed in *Neuberger* includes

a diode laser beam combiner comprising a cylindrical microlens, a lens array, and a fan window that optically combines energy outputs of the at least two diode laser emitters or emitter groups. The thusly combined energy can be coupled into an optical delivery fiber.

*Neuberger* (col. 7, lines 19-20) teaches that, for an effective coupling-in, the optical fiber must have an appropriate numerical aperture and diameter at a focus spot of the light to be coupled into the optical fiber. Figure 8 of *Neuberger* discloses an optical fiber having a fiber core with a first refractive index and a fiber cladding with a second refractive index. These two indices determine the numerical aperture of the optical fiber and, thus, the boundary of an acceptance cone. Radiation entering the optical fiber within this acceptance cone can be propagated throughout the optical fiber.

Amended claim 1 recites the limitation an optical waveguide having a coupling-in area which is curved in a focusing fashion. As a result of this feature, the boundary of an acceptance cone can be changed by the coupling-in area curved in focusing fashion. In contrast, *Neuberger* teaches the effect of material properties, expressed in refraction indices, but fails to teach or suggest anything associated with the effect of a particularly shaped coupling-in area on the boundary of an acceptance cone. In view of the foregoing, amended independent claim 1 is patentable over the *Neuberger* in combination with *Ulman* and/or *Tulip*.

Moreover, *Ulman* and *Tulip*, singly or in combination, fail to teach or suggest anything concerning an optical waveguide and, thus, fail to provide what *Neuberger* lacks. Therefore, amended independent claim 1 is patentable over the combination of *Neuberger*, *Ulman* and *Tulip* for this additional reason. Therefore, reconsideration and withdrawal of the rejections under 35 U.S.C. §103(a) are in order, and a notice to this effect is respectfully requested.

### **Dependent claims**

In view of the patentability of independent claim 1, for the reasons presented above, each of dependent claims 2-4 and 6-14 is patentable therewith over the prior art.

Based on the allowability of generic claim 1, rejoinder of claim 5 is respectfully solicited.

### **Conclusion**

Based on all of the above, it is respectfully submitted that the present application is now in proper condition for allowance. Prompt and favorable action to this effect and early passing of this application to issue are respectfully solicited.

Should the Examiner have any comments, questions, suggestions or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,

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